# TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE


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RE: Identification, Ecology, and Management of the Major Sagebrush Subspecies in Northwestern New Mexico.


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Cross Reference: Plant Communities and Range Sites.

## IDENTIFICATION, ECOLOGY AND MANGEMENT OF THE MAJOR SAGEBRUSH SUBSPECIES IN NORTHWESTERN NEW MEXICO

The genus Artemisia is known on all continents of the world. In the United States it occupies at least 96 million acres (Tisdale, et al 1969) and is found primarily in the steppe areas of the 11 western states. Uncertainties regarding the taxonomic status of the woody member of the genus Artemisia have resulted in confusion regarding the nature and distribution of various taxa, and have hindered studies of their ecology and response to land management practices.

Communities dominated by woody species of Artemisia constitute a major portion of northwestern New Mexico. The principal species involved is Artemisia tridentata, which occurs as a complex consisting of three subspecies.

These three taxa are:

1. A. tridentata tridentata (basin big sagebrush)
2. A. tridentata wyomingensis (Wyoming big sagebrush)
3. A. tridentata vaseyana (mountain big sagebrush)

In addition, there are two taxa of dwarf sagebrush: 1/

1. A. arbuscula arbuscula (low sagebrush)
2. A. arbuscula nova (black sagebrush)

They are all recognizable by morphological characterisitics and also show important ecological, phenological, cytological, and chemical (chromatographic) differences, (Winward, et al 1977). They have evolved to fit different ecological sites (range sites) within the sagebrush region, and their recognition as distinct taxa is basic for management of sagebrush-grass rangelands.

1/ This does not include A. bigelovii (Bigelow sagebrush)

IMPORTANT ARTEMISIA TAXA THAT OCCUR IN NORTHWESTERN NEW MEXICO

| Scientific Name | Common Name | Plant Symbol |
|---|---|---|
| A. arbuscula nova | black sagebrush | ARARN |
| A. arbuscula arbuscula | low sagebrush | ARARA |
| A. tridentata wyomingensis | Wyoming big sagebrush | ARTRW |
| A. tridentata tridentata | basin big sagebrush | ARTRT |
| A. tridentata vaseyana | mountain big sagebrush | ARTRV |

One of the interesting areas in which scientists have been working the past few years is in the refining of sagebrush taxonomy. What was once described as a few species has now been found to be many subtaxa, each with their own morphology, genetic makeup, and ecological requirements, (Winward, et al 1978). Those who have become familiar with the new classification systems are finding it easier to understand the ecology of each new taxon, and can better predict responses to particular land management practices.

IDENTIFICATION

Since we deal with both species and subspecies, some characteristics are confusing. For this reason, several features are often used to substantiate some separations. A few individual plants in most stands of sagebrush have unnatural environmental influences or some phenomena which alters a plant's natural appearance. In field work, however, problems from unusual individuals is minimal since we are generally dealing with full populations; for example, we are generally identifying the sagebrush on a site as an individual plant. The following "Key to Important Artemisia Taxa in Northwestern New Mexico" will prove helpful in identifying sagebrush.

In addition to using morphological features for classification, a useful chemical method used to separate certain sagebrush taxa has been developed, (Winward and Tisdale, 1969). This involves placing a few grams of leaf material into a clear glass test tube, adding enough methanol or ethanol to saturate the leaves, and allowing the material to react for one hour. This is followed by shining a long-wave, ultra-violet light (model SL-3660) on the solution in a darkened room and observing the color of the flourescing liquid.

KEY TO IMPORTANT ARTEMISIA TAXA IN

NORTHWESTERN NEW MEXICO

1a Mature 1/ shrubs less than 20" high

2a Inflorescence paniculate, seed stalks brownish and persist into following year----  ---- A. arbuscula nova

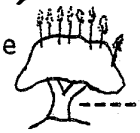
2b Inflorescence spicate or racemose, seed stalks grayish and weekly persistant------  ---- A. arbuscula arbuscula

1b Mature shrubs taller than 20" high 

3a Uneven topped shrubs, flower stalks arise throughout crown

4a Mature plants greater than 40" in height, leaf margins straight-----  ------- A. tridentata tridentata

4b Mature plants less than 40" in height, leaf margins belled outward----------  ----- A. tridentata wyomingensis

3b Even topped shrubs, flower stalks arise from upper crown and extend above foliage, leaf margins straight--------  ---- A. tridentata vaseyana

1/ Mature plants infer at least 20 years old

ECOLOGY

Ecological features that influence where the different sagebrush taxa grow include:

(1) elevation (as it affects temperature and soil moisture).
(2) soil depth, structure, drainage and chemistry.
(3) total yearly moisture and seasonal distribution.
(4) other less defined features such as number of cloud-free days per year and competing vegetation.

The following information is intended to be a general description of the distribution and ecology of sagebrush in northwestern New Mexico. Specific areas where some taxa have isolated, or scattered occurrences will not be mentioned.

Artmesia arbuscula nova (black sage brush)

Black sagebrush appears to have some affinity to calcareous soils with a high amount of surface rock or pavement (Winward, et al 1978). It is generally found over a shallow argillic horizon; however, it has been found over lithic contact in many areas. It generally occurs above 6,000 feet elevation and has been found as high as 8,000 feet. Black sagebrush is found in two color phases: gray and green. In the green, the leaves are sticky when crushed, and the crushed material puts out a pungent odor. In the gray phase, the plant is often confused with low sagebrush (A.arbuscual arbuscula). Black sagebrush seems to be used heavily by antelope, and to a lesser extent by deer. Sheep and cattle have been known to browse this taxa in some areas. Under severely depleted conditions, a high amount of bare ground becomes exposed on black sagebrush sites.

Artemisia arbuscula arbuscula (low sagebrush)

With few exceptions, low sagebrush is found on areas with a shallow impermeable "B" horizon or shallow, unfractured bedrock (Winward, et al 1978). It can withstand prolonged spring flooding and extensive summer drought. Low sagebrush grows in a hedged manner and is generally found on older, highly developed soils. It is also generally found in more mesic conditions than black sagebrush. It grows on less than 6,500 feet elevation to above 8,000 feet. Low sagebrush is found to be an important forage for deer and sheep.

Artemisia tridentata wyomingensis (Wyoming big sagebrush)

Wyoming big sagebrush is the most xeric member of the big sagebrush group. It is found on deep or mederately deep droughty soils. It seems to be associated with gravelly subsoils or a moderately deep argillic horizon. These soils are calcareous to the surface. This subspecies is generally 18 to 40 inches tall, and the bark is generally twisted and dark. It is not common above 7,000 feet elevation. If it does occur above 7,000 feet, it will be restricted to the more xeric environments. It must be noted that even under pristine conditions, Wyoming big sagebrush sites may have about 25 percent bare ground. Other sites would have less bare ground as limiting factors become less severe. It is possible that cryptogams fill the major portion of

these otherwise bare spaces with absolutely no disturbances. Relatively few perennial forbs occur with this subspecies, even under pristine conditions. This subspecies seems to have a low palatability rating.

Artemisia tridentata tridentata (Basin big sagebrush)

Basin big sagebrush is found in scattered, relatively small stands. On an acreage basis, it represents a minor portion of the sagebrush region of the state. Areas where it once was more extensive are now under cultivation. It grows on deep, well drained soils that are at least 5 degrees F cooler (at 20" depth) than soils associated with Wyoming big sagebrush. It can also be found around the perimeter of talus patches. This subspecies, however, is generally found in drained basins or along arroyos from around 6,000 feet to above 7,500 feet elevation. Perennial forbs are more abundant than on Wyoming big sagebrush sites, and potential herbaceous production is from one-third to two times higher. Basin big sagebrush was not a preferred taxon by sheep and deer (Sheehy, et al 1975).

Artemisia tridentata vaseyana (Mountain big sagebrush)

Mountain big sagebrush is found throughout the foothill and lower mountain areas of the sagebrush region of the state, ranging from elevations of 6,800 feet to 9,000 feet. It grows on deep, well drained soils where moisture is available most of the summer months. It is the most extensive subspecies in the state. The soils where this subspecies occurs are at least 5 degrees F cooler (at 20" depth) than soils associated with basin big sagebrush. Many species of forbs, grasses, and other shrubs are often found growing with it. It is not uncommon to find up to 40 plant species associated with this sagebrush (Winward, et al 1978). Generally, areas that are disturbed support a few remnant perennial species intermixed with annuals and dense sagebrush. Mountain big sagebrush was high in the preference group for mule deer and sheep (Sheehy, et al 1975). This subspecies seems to be the most important taxa for mule deer winter forage.

Although deer and antelope may show preference for subspecies of big sagebrush, as a group, the sagebrushes are less preferred than cercocarpus, quercus, atriplex or amalanchier by deer, barbary sheep and elk. Research would rank the big sagebrush (Artemesia) as fourth or fifth in preference, while being first in occurrence, within its New Mexico range.

## MANAGEMENT

Each of the sagebrush taxa mentioned have unique ecological features that should be considered in their management. Black sagebrush and low sagebrush appear to have very similar management requirements. These sites generally have low potential for improvement through reseeding. Programs geared at managing these sites should be designed to maintain an open stand of sagebrush with a scattered stand of native forbs and grasses. These sites usually have remnant forbs and grasses that will respond to proper range management for wildlife and, to some degree, for livestock, at least seasonally. Consideration should be given to wildlife in management of these sites, and sagebrush eradication should not generally be considered.

Many areas of Wyoming big sagebrush have lost their natural understory vegetation. Livestock and wildlife have been greatly responsible for these changes, but increased density of sagebrush and other shrubs due to fire suppression also has had a significant impact. Where most of the remnant perennials have been lost, some type of brush manipulation may have to be implemented before either native or introduced grasses can be established. Western wheatgrass (Agropyron smithii) was associated with Wyoming big sagebrush in pristene condition; however, relict areas in Taos County indicate that galleta (Hilaria jamesii) was the dominant grass, and blue grama (Bouteloua gracilis) was the co-dominant grass. Any reseeding projects in Wyoming big sagebrush sites require very careful on-site evaluation prior to brush manipulation due to the droughty nature of the soils. The most common grass seeded into these sites is crested wheatgrass; however, the release of improved strains of galleta holds great promise for the Wyoming big sagebrush sites. Grasses, such as western and pubescent wheatgrass, should not be recommended on Wyoming big sagebrush sites.

Basin big sagebrush sites have the potential to produce more herbaceous vegetation than Wyoming big sagebrush sites. The majority of the stands that remain have lost most of their native understory species. Basin big sagebrush shows only moderate increases in density with disturbance of associated vegetation, but may increase greatly in foliage cover due to enlargement of crown cover. Where the understory species have been lost, introduced grasses such as crested wheatgrass, pubescent wheatgrass, or on some sites, intermediate wheatgrass can be established. Native species, such as western wheatgrass can be reestablished on these sites. Generally, grasses that develop rhizomes should be considered for these sites due to the usual erosive nature of soils found associated with basin big sagebrush.

Mountain big sagebrush has a potential for increasing its cover more than any other sagebrush subspcies (Winward, et al 1978). In some locations, dense stands are used by wildlife, especially during the reproductive phase. Mule deer often will use these dense stands for fawning sites. Some of these areas should be maintained in a dense stand for this important purpose. The majority of the many acres covered by this subspecies will need periodic manipulation brush. Often there are adequate amounts of native understory species on mountain big sagebrush sites. If seeding is necessary, crested wheatgrass, pubescent wheatgrass, and western wheatgrass can be successful. Mountain big sagebrush will come back faster than the other subspecies, even under good range management practices.

## CONCLUSION

Wyoming, basin, and mountain big sagebrush make up the major sagebrush acreage in the state. They have evolved to fit different habitats within the sagebrush region, and their recognition as distinct taxa is basic for the management of the sagebrush-grass rangelands. Differences in requirements for management among the three taxa are related to the kind of sites each occupies, their reaction to depletion of understory vegetation, their use by wildlife and livestock, and their seasonal growth development (Tisdale, et al 1969).

Cover of brush is often used as a measure of condition; however, unless cover is related to the particular subspecies on a site, it may have little value. For example, Wyoming big sagebrush stands range from 8 percent sagebrush cover on good condition rangeland to 23 percent on highly disturbed (Winward, 1970). Mountain big sagebrush, on the other extreme, ranges from 14 percent cover on good condition rangeland to 41 percent on poor condition rangeland.

There have been differences of opinion concerning the geographic distribution of sagebrush now compared to the presettlement period. Tisdale, et al (1969) concluded that, aside from some local movement of sagebrush into meadows where the watertable has been lowered, "the geographic area currently dominated by woody species of sagebrush is essentially the same today as in presettlement times."

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